

We claim:

1. A plant comprising:

1130 genomic material which includes genes which give incomplete reduction of the activity of at least two specific isoforms of the enzymes in the starch synthesis pathway of said plant.
2. A plant according to Claim 1 which forms starch which has different branching structure than the starch formed by a similar plant as described in Claim 1

1135 which comprises genomic material which does not form isoforms of the enzymes in the starch synthesis pathway of the plant.
3. A plant according to Claim 2 in which said starch forms in grain.

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4. Grain produced by a plant in which the genotype of the grain is mm^*/n^{**} , where m = first mutant n=second mutant and * equals wild type.
5. A starch producing plant comprising:

1145 genomic material which includes genes which give incomplete reduction of the activity of at least two specific isoform enzymes in the starch synthesis pathway of said plant whereby said plant produces substantially more starch than said plant would produce if said genes gave complete reduction of the activity of the same two specific isoform enzymes within the starch pathway.

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6. Grain having an endosperm genotype selected from the group consisting of: $wxwxWx/AeAeae$, $aeaeAe/WxWxwx$, $wxwxWx/SuSusu$, $susuSu/wxWxwx$, $aeaeAe/SuSusu$, $susuSu/AeAeae$, $wxwxWx/DuDudu$, $aeaeAe/DuDudu$, $susuSu/DuDu du$.

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7. Grain having an endosperm genotype comprising two doses of a first mutant allele of a gene which affects starch structure and one dose of a second mutant allele of a second gene which affects starch structure, said genes can be selected from waxy, amylose extender, dull, horny, sugary, shrunken, brittle, floury, opaque.
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8. The starch extracted from a grain ^{from a plant having allowed plant} ~~according to claim 7~~ ^{claim 7} having a genotype of $wxwxWx/AeAeae$. ^{6,274,792.B1}
- 1165 9. The starch extracted from a grain ~~according to claim 7~~ having a genotype of $Aeaeae/WxWxwx$.
- 1170 10. A plant having a diploid genotype of aa/BB and a triploid endosperm genotype of aaA/BBb which has starch where a is a recessive mutant gene and A is the wild type gene, and b is a recessive mutant gene and B is the wild type gene and the starch is altered from the normal starch, a and b can be selected from ae , du , wx , sh , bt , h , su , fl , op and B and A can be selected from Ae , Du , Wx , Sh , Bt , H , Su , Fl , Op .
- 1175 11. A plant having a diploid genotype of $aA/Bb/Cc$ and a triploid endosperm genotype of $aaA/BBb/CCc$ (and other combinations thereof) where a is a recessive mutant gene and A is the wild type gene, and b is a recessive mutant gene and B is the wild type gene, and c is a recessive mutant gene and C is the wild type gene and the starch is altered from the normal starch where a and b
- 1180 can be selected from ae , wx , sh , bt , h , su , fl , op , du and B and A can be selected from Ae , Wx , Sh , Bt , H , Su , Fl , Op , Du .
12. A method of producing grain with altered starch qualities which includes the steps of:

- 1185 a) planting a parent which is capable of flowering and has complete reduction of at least one specific isoform enzyme in the starch synthesis pathway;
- b) planting a second parent having a complete reduction of at least one other specific isoform enzyme in the starch synthesis pathway;
- 1190 c) eliminating said first parent's capability to produce pollen;
- d) pollinating said flowering first parent with said second parent's pollen; and
- e) harvesting the grain produced by said first parent.
- 1195 13. The method according to claim 12 including the step of extracting said altered starch from said grain.
14. The starch extracted from the grain ^{produced by a plant} ~~according to claim 4~~ wherein a and b designate the same mutant and B and A designate the same wild type.
- 1200 15. The starch extracted from grain having at least four doses of mutant and two doses of wild type, such that the genotype has wild type on each side.
- 1205 16. The starch extracted from grain having at least three doses of mutant and three doses of wild type, such that the genotype has mutation on each side.
17. A single mutant male sterile plant where the mutant is selected from ae, wx, sh, bt, h, su, fl, op, du.
- 1210 18. A sol comprising water and an effective amount of a starch extracted from a starch bearing plant having a waxy, waxy, amylose extender genotype.

- 1215 19. The sol of claim 18 wherein the starch is present in an amount of about 1% to about 20% by weight.
20. The sol of claim 18 wherein the plant is maize.
- 1220 21. The sol of claim 18 wherein the starch is cold water soluble.
22. The sol of claim 18 wherein said starch is in granular form.
23. The sol of claim 21 wherein said starch is extracted from maize.
- 1225 24. A foodstuff comprising a foodstubb and having as an essential ingredient therein an effective amount of a starch extracted from a starch bearing plant having a waxy, waxy, amylose extender genotype.
- 1230 25. The foodstuff of claim 24 wherein said starch is present in an amount of about 0.1% to about 10% by weight foodstuff.
26. The foodstuff of claim 24 wherein said starch is extracted from maize.
- 1235 27. A method for making a sol containing starch comprising the steps of:
forming a slurry comprising water and an effective amount of a starch extracted from a starch bearing plant having waxy, waxy, amylose genotype; and
cooking said starch to gelatinize said starch.
- 1240 28. The method of claim 27 wherein said effective amount is about 1% to about 20% by weight slurry.

29. The method of claim 27 wherein said starch is extracted from maize.
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30. A method for thickening a foodstuff comprising the steps of:
- combining with a foodstuff an effective amount of a starch extracted from a starch bearing plant having a waxy, waxy, amylose extender genotype; and
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- cooking said foodstuff to thicken said foodstuff.
31. The method of claim 30 wherein said starch is extracted from maize.
- 1255 32. The method of claim 30 wherein said starch is present in an amount of from about 0.1% to about 10% by weight of said foodstuff.
33. An improved method for making a foodstuff which contains a gelatin said improvement comprising replacing at least a portion of the gelatin in said
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- foodstuff with the sol of claim 18.
34. An improved method for making a foodstuff which contains a natural gum, said improvement comprising replacing at least a portion of the natural gum with the sol of claim 18.
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35. The method of claim 34 wherein said foodstuff is a gum candy, a gelled dessert, a glaze, or a spread.